the square root of which, is $\sqrt{2275} = 47 \cdot 69$; then we get $An = \frac{1}{3}(20 \times 4 - 47 \cdot 69) = 10 \cdot 77$; and finally, it is $FE = 2(20 - 10 \cdot 77) = 18 \cdot 46$ feet, the length of the equal sides of the figure.

This is the method of obtaining the result by the principles of algebra, but there is still another method to which we beg leave to direct the reader's attention, as it may in most instances be more readily applied than that which we have just illustrated; it is as follows. By the construction, Da or Dc which is equal to it, is taken of any convenient magnitude at pleasure, we may therefore suppose it to be represented by any particular number, say 5; then, since Cm is equal to twice Dc, we have $Cm=10$.

Now $BD = \sqrt{BC^2 + DC^2} = \sqrt{225 + 400} = 25$ feet, and the angle CBD is equal to BDE; but the angle CBD is such, that tan. CBD $= \frac{DC}{BC} = \frac{15}{20} = 0 \cdot 75$, the natural tangent of 36° 52′ 12″ very nearly; therefore, by trigonometry, we have

$Cm : Dc :: \sin. BDE : \sin. Dmc$; that is,
$10 : 0 \cdot 6 :: 5 : 0 \cdot 3$, the natural sine of 17° 27′ 28.″

Here then, in the triangle mDc, we have given all the angles and the two sides Dc and mc, to find the third side Dm, and for this purpose it is

$\sin. mDc : mc :: \sin. mcD : Dm$; that is,
$0 \cdot 6 : 10 :: 0 \cdot 8223 : 13 \cdot 54$ feet nearly, and by the property of similar triangles, we get

$Dm : Cm :: DB : EB$; that is,

$13 \cdot 54 : 10 :: 25 : 18 \cdot 46$ feet, the same as before.

We have been very full and explicit in the resolution of this problem, not indeed from any conviction or impression that it makes on our mind as regards its utility or importance, but with the view of instigating the proposer, and others that may be similarly situated, to the study of arithmetic and constructive geometry, as without an accurate and extensive knowledge of these departments of science, they will in many cases find themselves either obliged to grope at random after their object, or to make their escape from surrounding difficulties by following blindly a slavish routine; whereas with a competent acquaintance with the principles of practical science, as applied to the different branches of their respective professions, they would be enabled to see their way through every intricacy, and thereby to bring their undertakings to a successful and satisfactory termination. T.

*** After the above was in type, we received nine other communications on the subject, some of which possess the merit of great simplicity.

INSTITUTION OF CIVIL ENGINEERS.

FEB. 17th. Sir John Rennie, president, in the chair.—The paper read was "On water for locomotive engines, and its chemical analysis," by William West, Associate. The author commenced by commenting somewhat severely on the want of precaution manifested in the choice of the watering stations on railways, where, he contended, previous analysis of the quality of the water would have avoided not only considerable expenditure in subsequently procuring fit kinds of water, but would have prevented great destruction of the boilers, and inconvenience from the tendency to prime which was induced by certain substances being either in solution or held in suspension. He then treated of the various kinds of earthy crust or "fur" deposited by evaporation; these he shewed the various compositions of; the principal components being carbonate and sulphate of lime, whose powers of conducting heat were so inferior, that when deposited upon a metallic plate or tube, which should be in contact with the water, the caloric traversed slowly, diminishing the evaporating power of the fuel in proportion to the accumulation of deposit, and, at the same time, oxydating the metal with great rapidity.

The various substances present in spring or river waters, such as soda, lime, magnesia, as bases, and sulphuric acid, carbonic acid, and chlorine, which represents hydrochloric or muriatic acid, iron, and organic matters, were then reviewed, and the discrepancies in the results of analysis by different chemists were treated of, and it was shewn, that although there were apparent differences of opinion among chemists, they were not in reality so great as existed among engineers on the relative merits of the locomotive and atmospheric systems, the screw and the paddle-wheel, and the broad and narrow gauge. In treating of the "modus operandi" of analysis, the imperial gallon was recommended as a uniform standard of quantity for the chemist, as being a measure known to and understood by all, and enabling the engineer to discard the minuter fractions of the chemist, and to attend with exactitude to whole numbers in results. As an instance, it was stated, that an engineer might be tempted to disregard the presence of three-quarters of a grain of deposit from a pint of water, but the deposit of one thousand gallons of such water would amount to fourteen ounces avoirdupois, which was a very tangible quantity.

In examining the tendency of different compounds to deposit, it was shewn, that sulphate of lime was more disposed than the carbonate to attach itself to the plates: that a mixture of the sulphate caused a harder deposit than the carbonate alone, and therefore waters containing much sulphate should be avoided. It was shewn also, that although what is generally termed "hard" water might be considered inferior to "soft" water, yet in the question of deposit, hardness and softness were only vague terms, and could not be accepted as positive rules; inasmuch, as muriate of lime which imparted great hardness to water, and therefore rendered it unfit for domestic purposes, was a very soluble salt, and therefore did not form any detrimental deposit or crust during ebullition. It appeared that the author could only recommend, as a means of precaution against incrustation, the selection of waters which by analysis were found to contain only soluble salts, or in situations where bad water could alone be obtained, that the boiler should be frequently "blown through," in order to get rid of the dense saturated part of the water before the crust had time to be deposited. The introduction of substances, such as potatoes, leather shavings, &c., into the boiler, in order to prevent incrustation by enveloping the earthy particles in a slimy coating, being inapplicable to locomotives, because of the tendency to induce priming.

The paper noticed slightly the various patents for preventing adhesion in boilers, and in the appendix gave the analysis of many kinds of water which had been submitted to the author professionally for his opinion. In the discussion which ensued, Mr. Gooch demonstrated the importance of the subject to railway and steam-boat companies, and stated that his attention had been called to a process invented by Dr. Ritterbant, for preventing incrustation in boilers. That process consisted simply in the addition of a small quantity of muriate of ammonia to the water in the boiler. It had been found, that this process not only effected the object proposed, but that it disintegrated and removed the incrustation already formed. In all the locomotives in which it had been used, the steam was much more readily generated, so that the blast pipes of several engines had been enlarged without diminishing this facility. There was, therefore, no doubt, of a great saving of fuel being effected by the process, the expense of which was stated to be about threepence per hundred miles run of a locomotive engine.

In sea-going steamers, the success of the experiment had not been less remarkable. In all these cases the water had been tested by practical chemists, without the slightest trace of iron or copper being detected, shewing that there was no injurious effect upon the metal of the boiler, &c., he looked upon the process as perfect.

Dr. Ritterbandt, in a concise and lucid manner, stated the results of his investigations; it appeared that carbonate of lime was the only substance which formed a solid incrustation; the other substances being merely mixed with, and cemented by the carbonate. That the muriate of ammonia acted as a perfect solvent on the carbonate of lime, converting it into the soluble muriate, without acting upon the boiler. He gave a practical demonstration of the action of the muriate of ammonia on calcareous water to the satisfaction of the president and members, who expressed themselves in terms of approbation of the great practical utility of the invention, and of the manner in which it had been brought before the society.

WILLIAM OF WYKEHAM.

THE first part of "Old England's Worthies," one of Mr. Knight's wonderfully cheap and instructive illustrated works, contains a sketch of the life of this great architect, from which we condense the following:—

There is an old tradition, perhaps not worthy of much credit, that upon the wall of a tower in Windsor Castle, known as the Winchester Tower, was inscribed, 'This made Wykeham.' The great churchman raised this tower as the architect of Windsor Castle, working under the commands of his patron Edward the Third. It is further said, that the king being offended at this inscription, its more obvious meaning was dexterously explained away, seeing that it should be interpreted to record that the building of the castle was 'the making' of the architect. There are other proud edifices still remaining upon which might be inserted 'This made Wykeham' in the most complete sense. No man ever left more permanent traces of his course and character. The founder of Winchester College, and of New College, Oxford,—the builder of the noblest part of Winchester Cathedral,—had a title to be called their 'maker,' with no king or subject to dispute his pretensions. He was one of the very few men who, having raised themselves by their abilities and integrity to riches and honour, worked not sordidly for themselves to heap up treasure, but nobly employed their wealth in works of the highest public utility. The life of such a man is for example. William de Wykeham, or of Wykeham, was born at Wykeham or Wickham, in Hampshire, in the year 1324, and, as his biographer Bishop Lowth has shewn, some time between the 7th of July and the 27th of September. The parents of Wykeham are held to have been poor, but of creditable descent and reputable character.

There seems to be no reason for supposing that he ever studied at Oxford, as has been affirmed by some of the later writers of his life. It is evident, indeed, that he had not had a university education, and that he never pretended to any skill in the favourite scholastic learning of his age. His strength lay in his natural genius, in his knowledge of mankind and talent for business; and probably the only art or science he had much cultivated was architecture. He is said in an ancient contemporary account, to have been brought to court when he was no more than three or four and twenty, which would be about the year 1348; but the earliest office which there is the evidence of records for his having held, is that of clerk of all the king's works in his manors of Henle and Yesthampsted, his patent for which is dated 10th of May, 1356. On the 30th of October in the same year, he was made surveyor of the king's works at the castle and in the park of Windsor. It is affirmed by a contemporary writer to have been at his instigation that King Edward pulled down and rebuilt great part of Windsor Castle. Wykeham had the sole superintendence of the work. Queenborough Castle, in the Isle of Sheppy, was also built under his direction.

Upon the death of William de Edyngton, on the 8th of October, 1366, Wykeham was immediately, upon the king's earnest recommendation, elected by the prior and convent of Winchester to succeed him as bishop of that see.

At the period of Wykeham's election to the see of Winchester, the bishops of that diocese had no fewer than twelve different castles or palaces, all furnished and maintained as places of residence. Wykeham's first undertaking, after he found himself in possession of the see, was to set about a thorough repair of these episcopal houses. To these palaces, or castles, the Bishops of Winchester resorted in turns, 'living, according to the custom of those times, chiefly upon the produce of their own estates. So great a demand as the bishop had upon his predecessor's executors for dilapidations could not very soon or very easily be brought to an accommodation; however, the account was at last settled between them without proceeding on either side to an action at law. In the first place they delivered to him the standing stock of the bishopric due to him by right and custom: namely, 127 draught horses, 1556 head of black cattle, 3876 wethers, 4777 ewes, 3521 lambs; and afterwards for dilapidations, in cattle, corn, and other goods, to the value of 1662*l.* 10*s.* sterling.' Before his repairs were accom-